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AN EPIDEMIC OF NOMA; REPORT OF SIXTEEN CASES.

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Noma is a disease characterized by rapidly developing gangrenous sloughing with frightful destruction of tissue. It is observed almost exclusively in children, and especially betweeen the ages of three and eight.

It fortunately occurs so rarely that many a physician with a large practice never has seen a case, and in large clinics its occurrence is a rarity. Allchin reports that during seven years there were in the East London Hospital for Children only five cases out of a total of 6364 admitted, and that during thirteen years there were only six cases out of a total of 13,000 admitted to the Hospital for Sick Children.

Its place of predilection is the mucous membrane of the mouth—gum or cheek. In its rapidly destructive progress it quickly attacks the periosteum, which soon undergoes gangrenous change, while the greater part of the cheeks, the upper and lower lips, and the eyelids may be destroyed with complete exposure of the mouth and pharynx. This gangrenous process may, however, though much more rarely, affect other parts of the body with the same destructive effect, and cases of noma involving the genitals and ears have been occasionally observed.

The exhaustion which results directly from this great destruction of tissue is so marked that few cases recover. Bruns gives a mortality of 70 per cent. in 413 cases, and Rilliet and Barthez a mortality of 95 per cent. in 21 cases.

It is said to occur in children recovering from acute disease when the sanitary conditions are bad. Henoch attributes to poor food, lack of cleanliness, and unhealthy, damp dwellings the principal predisposing causes, and with such conditions he has seen it follow bronchitis, pneumonia, and dysentery, especially in children with tuberculous tendencies. Measles, scarlet fever, and typhoid are the pathological conditions in the wake of which this disease most commonly develops, and of these measles has been most frequently observed as the precursor.

Osler claims that at least one-half of the cases develop during the convalescence of measles, while Krahn, in an able paper in the *Mittheilungen aus den Grenzgebieten der Medicin und Chirurgie*, 1900, Heft 4 und 5, records 55 out of 133 cases as developing after measles.

Bouley and Caillant found that measles was the antecedent in 41 out of 46 cases.

In April, 1900, an epidemic of measles occurred at the Albany Orphan Asylum, an institution which cares for 450 children of both sexes, ranging in age from two to fifteen years. The type of disease was severe. Among the 173 cases of measles 32 had complications, twelve had pneumonia, five had pneumonia and gangrene, eleven had noma without other complication, four had lesions which were considered to be beginning noma, but in which the process was stopped in its incipiency by thorough cauterization under chloroform.

Of the twelve cases of pneumonia two died; the five children with pneumonia and gangrene all died, while two only of the eleven cases of noma without other complication died.

Of the sixteen cases of noma the mouth alone was affected in four cases, the mouth and other parts, the ear, and vulva in three cases; the vulva alone was attacked in two children, and in seven with other parts. The gangrene involved the rectum alone in three children, and with gangrene of other parts in five children.

Of the fatal cases noma involved the mouth in three children and the rectum in four children. Pneumonia was, however, the direct cause of death in five of these cases, and in the two patients where no pneumonia was present one had noma of the mouth and the other noma of the rectum.

The ages of the children affected ranged from three to twelve years. Two were in their fourth year, five in their fifth, three in their sixth, four in their seventh, one each in the eighth and ninth, three in the tenth, and one in the eleventh, twelfth, and thirteenth years respectively.

The exciting cause of this series of cases is evident, but the predisposing cause is not so apparent. Poor food, unhealthy, damp dwellings, and lack of cleanliness are usually given as the predisposing causes.

This institution is situated on high ground in a very healthy section of the city, with considerable surrounding space. It consists of a main building of brick, three stories and basement, and three pavilions of wood—two, two stories and basement, and one, one story and basement.

The basement of the main building is occupied by the kitchen, dining-rooms, and bath-rooms. The basements of two of the wooden pavilions were used as school-rooms for about half the boys and girls. Heating is by hot-air furnaces and stoves. Although there were no cellars underneath, no noticeable dampness was evident. All the children slept in the first and second stories. The boys played out-of-doors, while the girls took their exercise in the basement of one of the pavilions.

The character of the food was closely examined, and, although there seemed to be a lack of variety, its nutritive value was high. The average age of the children is eight years, and they were considered each to require 0.5 of the food of a man, or 1750 calories, one-quarter of this amount being taken at breakfast and supper and one-half at dinner. The breakfast consists of coffee (malted barley roasted), milk, sugar, and bread; the dinner of a beef and vegetable stew and bread; the supper of coca, milk, sugar, bread, and cookies.

There has never been any evidence of lack of cleanliness, and the plumbing throughout is excellent. It can, I believe, be truthfully said that the lodging, food, and care of these children are much superior to that which many children of the poor receive in our large cities. That the general hygienic and dietetic conditions have been excellent is evidenced by the fact that the mortality for the last eight years has averaged 19.4 per thousand, and in 1899, the year preceding this epidemic, there were but four deaths for the entire year.

This occurrence of sixteen cases of noma would seem to be entitled to be called an epidemic. That epidemics of noma occur has been generally denied, and in the epidemics reported in the seventeenth, eighteenth, and early part of the nineteenth century the diagnosis is now questioned. The fact, however, that it occurs in institutions in groups indicates its specific character. Savard[1] and Poupart[2] saw an epidemic of noma in the old Hotel Dieu, Paris, in 1699. Martin[3] noted its occurrence in the Charity Hospital of Lyon in 1796, and considered the ravages of the Revolution as an etiological factor. Lund,[4] of Stockholm, in 1765, observed the development of two cases in children kept in a damp room with hygienic surroundings. Cliet[5] reports eight cases in the General Hospital of Lyon, in 1817. Baron[6] saw, in 1816, cases among infants in the Foundling Hospital of Paris. Luming[7] describes two cases of noma occurring in the Institute for Children's Diseases,

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[1] Nouveau recueil d'observations chirurgicales, Paris, 1702.

[2] Historie de l'académie royale des sciences, année, 1699.

[3] Recueil dec actes de la Société de Lyon, 1798.

[4] Der K. Schwedischen akademie der Wissenschaften Abhandlungen, 1765.

[5] Compte-Rendu medico-chirurgicale, Lyon, 1823.

[6] Journal de Médecine, T. xxxvi., 1816.

[7] Dublin Hospital Reports, vol. iv., 1827.

Dublin, in 1824. Ryland[1] observed, after an epidemic of measles in Birmingham, in 1837, eight cases of noma of the cheek and three of noma of the genitals. Barthez and Rilliet[2] declare, as a result of the study of the literature and their own experience, that it is not contagious, although they do not think that point completely settled. d'Espine-Picot[3] claims that it is not contagious. Richter[4] could not find a cause in the diet, cleanliness, or nursing, and believes it was due to a miasma. Loschner[5] observed in the Lazarus Child's Hospital in Prague the repeated occurrence of noma in the room where the first noma case occurred. Bruns[6] believes that the miasmatic or contagious origin and development has not been determined with sufficient certainty. Gierke reports twenty cases of noma occurring in the Child's Hospital in Stettin during seventeen years. Six of these cases developed after the admission of two cases of noma. The general hygienic conditions were good, and he believes it was impossible for it to have been due to such conditions. During an epidemic of measles in the New York Foundling Asylum, in 1891, seven cases occurred among 165 children sick with measles. The misuse of mercury was supposed, however, to have had much influence in inducing this complication.

In the sixteen cases here reported all the cases developed in the girls' dormitory, except two cases in boys who were in the infirmary, where cases of gangrene were being treated. Although there were almost twice as many cases of measles among the boys as among the girls, no cases of noma developed in their dormitory. The first case was detected by the putrid odor coming from the patient. An examination then revealed that the vulva was gangrenous. This process rapidly extended to the rectum, with complete destruction of the intervening tissue. After the discovery of this case the children were carefully examined. The other cases developed in this dormitory where there was the possibility of contagion by soap, towels, etc., and none in the boys' dormitory, although they were under precisely the same hygienic conditions. It was noted, also, that after the cases were thoroughly isolated no new cases developed.

The disease began with a slight ulceration of the mucous membrane with a surrounding area of intense hardness. This quickly became dark, with a dark, brownish-red border, broke down, and had a most offensive odor. The process was in some cases frightfully rapid, so that the tissue seemed to necrose *en masse*. No complaint of pain was made by the children, and the washing and dressing of the ulcerated surfaces did not cause distress.

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[1] Lancet, 1838, vol. ii

[2] Manuel Pratique des Maladies de l'Enfance.

[3] Heckars literar Annal, 1829.

[4] Vierteljahrschrift f. d. prakt Heilkunde, 1847.

[5] Die chirurg. Pathologie u. Therapie des Kau. u. Geschmacksorgans, Tübingen, 1859.

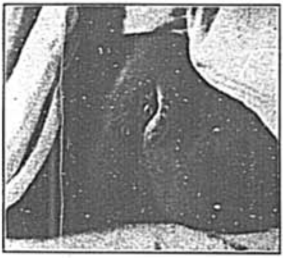
[6] Jahrbuch f. Kinderheilkunde, 1868.

The general treatment was stimulating—alcohol, iron, quinine, strychnine, nitroglycerin, and concentrated nourishment. The local treatment was cleanliness, frequent douching with 50 per cent. boric acid solution, then with pure hydrogen dioxide, and constant wet dressings of Labarraque's solution. Where the destruction was not too extensive thorough cauterization under chloroform with the Paquelin cautery seemed to stop the progress of the gangrene, and in four cases not counted in this series the cauterization so completely stopped the process as to render the diagnosis doubtful.

The following histories are typical of the cases observed:

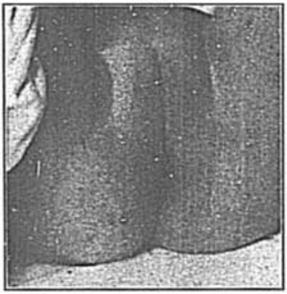
I. B., aged three years, a girl. Family history unknown. (Figs. 1 and 2.) Several days after the disappearance of the rash of measles gangrenous ulcerations were found on both labiæ majora, with a surrounding areola of hard infiltrated tissue. The labiæ were markedly swollen. Thorough cauterization under chloroform with the Paquelin cautery stopped the progress of the gangrene, and the ulceration healed under the use of zinc ointment.

FIG. 1.



Noma affecting both labia majoræ.

FIG. 2.

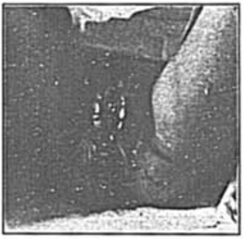


Condition present one year later.

The temperature was above 101° F. on only two days, and after ten days remained normal. The pulse ranged from 96 to 136, and was weak.

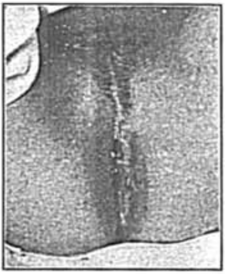
J. B., aged six years, a girl. Family history unknown. (Figs. 3 and 4.) A week after the disappearance of the rash a slight ulceration, with a surrounding hard infiltration, was found on the posterior aspect of the vulva. This ulceration gradually extended toward the rectum. The vulva then became much swollen and had a dark, reddish hue. The inflammation extended on all sides two inches beyond the vulva. After a week, during which time the condition seemed stationary, the inflamed area sloughed off *en masse*. (The photograph was taken just before the sloughing occurred.) The temperature was normal or subnormal, and the pulse very weak and irregular. After the sloughing the wound healed rapidly. There is now a constant discharge of fecal matter through the vagina.

FIG. 3.



Noma affecting the vulva and rectum.

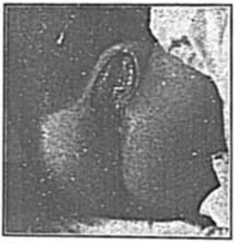
FIG. 4.



Condition present one year later. Fecal incontinence per vaginam.

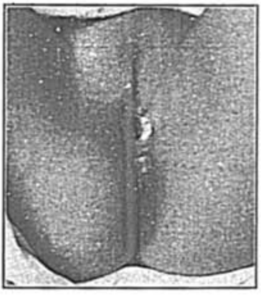
K. K., aged seven years, a girl. Family history unknown. (Figs. 5 and 6.) Six days after a mild attack of measles a putrid odor was detected, which, upon examination, was found to come from a gangrenous ulceration of the vulva. The centre of the ulcerated area was black, and the surrounding tissue hard and of a dark, brownish color. The process rapidly extended to the rectum, and there was a complete sloughing of all the intervening and surrounding tissue.

FIG. 5.



Noma affecting the vulva and rectum.

FIG. 6.



Condition present one year later.

The temperature did not go above 100° F., and the pulse was of good quality and ranged from 84 to 106.

L. B., aged three and one-half years, a boy. Family history unknown. Had an attack of measles, with high fever. He became much prostrated, tonsils were enlarged and ulcerated, and there was marked dyspnœa. Dulness with bronchial breathing was discovered over both lungs. Gangrene of the rectum was detected ten days after the occurrence of the measles. Two days later the mouth and tonsils were found to be gangrenous. After three days the patient died, and the autopsy was made by Dr. Blumer.

The bacteriology of noma has been the subject of a number of researches, each, as a rule, bearing only on one or two cases.

Froriep[1] seems to have been the first to describe parasites in this condition. He figures certain large cells between the muscle fibres, which he considers a form of yeast, but which some later observers interpret as mastzellen.

Schimmelbusch[2] later described in a single case bacilli, at times short, at times appearing in long threads, which were present in the gangrenous tissue in large numbers. They decolorized by Gram. He was able to cultivate them with ease on all kinds of media. Lingard[3] describes similar bacilli in one case.

Grawitz[4] in a single case observed bacilli which grew into long threads at the junction of the necrotic and healthy tissue. They stained by Gram.

Ranke[5] describes cocci in sections from cases which he studied. He made no cultures.

Bartels[6] studied two cases microscopically. In the depths of the necrosed tissue he found in both cases innumerable long, slim bacilli. In one case he notes the thread-like forms. He states that spores were to be made out. The organisms stained by Gram. He made no cultures.

Guizetti,[7] and Babes and Zambilovici,[8] in four cases describe short, thick bacilli with pointed ends, facultative anaërobes, which grew on various media. They stained by Gram's and Weigert's methods in sections, but not in pure culture. Elder[9] also describes bacilli with pointed ends, which might be similar as far as can be judged from his description.

Foote[10] describes long bacilli, at times forming chains, which stained by Gram if decolorization was not carried too far. He was unable to cultivate the organism, but isolated pus cocci (staphylococcus aureus, streptococcus pyogenes, micrococcus cereus albus).

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[1] Chirurgische Kupfertafeln, 1844, p. 458.

[2] Deutsch. medicinische Wochenschrift, 1889, Bd. xv. p. 516.

[3] Lancet, London, 1888, vol. ii. [4] Deutsch. medicinische Wochenschrift, 1890, p. 318.

[5] Jahrbuch für Kinderheilkunde, 1888, Bd. xxvii.

[6] Ueber Noma. Inaugural Dissertation, Göttingen, 1892.

[7] Policlinico, September-October, 1896.

[8] Annales de Pathologie et Bacteriologie de Bucarest, 1895, vol. v.

[9] Edinburgh Medical Journal, September, 1894.

[10] THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1893, vol. cvi.

Nikolaysen[1] found cocci and bacilli in two cases. He was able to cultivate the latter.

Schmidt[2] describes one case in which he was able to cultivate only cocci. In sections he found a mixture of organisms near the surface of the slough, but deep down only slim bacilli. They showed thread-like forms and stained by Weigert, but only faintly by Gram.

Petruschky[3] in one case found diphtheria bacilli, with organisms which he describes as vibrios, and also spirilla. He cultivated only the diphtheria bacilli, and considered them the cause of the process.

Perthes[4] describes in two cases an organism of the streptothrix variety, which he was able to grow anaërobically, but which he did not isolate in pure culture. Krahn doubts that true branching existed in these organisms.

Saft[5] describes cocci and bacilli which he cultivated from one case. The latter he describes as diphtheria-like.

Krahn[6] examined two cases, and found in the deeper parts of the necrotic zone thread-like bacteria, which he compares in appearance with the spirillum sputigenum and the spirochæte dentium. He was unable to cultivate them in ordinary media or in tubes where air was excluded by means of paraffin. From their similarity in appearance to certain mouth organisms he suggests that they are merely mouth organisms exalted in virulence.

To sum up these findings it may be stated that in practically all cases the superficial parts of the slough showed, as would be expected, mixed cultures; in the deeper parts, on the other hand, the sections often showed almost a pure growth. The organisms most frequently found were slim, thread-like bacteria, decolorizing rather easily by Gram and not growing on ordinary media.

In a few cases, as those of Schimmelbusch and Lingard, thread-like organisms easily cultivated were described. In other cases organisms obviously differing entirely from these thread-like forms are described.

Nine of the sixteen cases occurring in the Albany Orphan Asylum were examined. They were selected as cases which showed all the different stages of the process.

The examination included cover-slip examinations in all cases, and cultures on blood serum, agar, and bouillon grown aërobically and also in the Buchner jar.

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[1] Cited by Krahn.

[2] Jahrbuch für Kinderheilkunde, 1898, Bd. xlviii.

[3] Deutsch. medicinische Wochenschrift, 1898, No. 15.

[4] Verhandlung d. Deutsch. Gesellsch. für Chirurgie, XXVIII. Kongress.

[5] Ueber Noma. Inaugural Dissertation, Halle, 1898.

[6] Mittheilungen aus den Grenzgebieten der Medicin und Chirurgie, 1900, Heft 4 und 5.

The result of the bacteriological examination of the nine cases can be briefly summarized as follows:

In all cases one organism and one alone was constantly present in large numbers in cover-slips. This was an organism which in smears took the form of a leptothrix. It averaged one-half micron in breadth, and varied from five to twenty microns or even more in length. The short forms were usually bent, the long forms curled or wavy. The organism stained rather poorly with gentian violet, much better with carbolfuchsin. It did not decolorize by Gram, though it stained faintly by his method. It showed no branching. In smears from the early cases this was almost the only organism present. As the process grew older the cover-slips showed a greater mixture of organisms. Those from the later stages showed beside the thread-like organism, short, thick bacilli decolorizing by Gram, and also cocci either in groups or chains which did not decolorize by Gram. All of the cultures failed to show the thread-like organism. The colon bacillus was present in all cases, as were some of the pus cocci, the streptococcus pyogenes occasionally, much more commonly the staphylococcus aureus.

Of the cases which died we were able to procure an autopsy on but one, a boy, in which the gangrenous process surrounded the anus. The cause of death was a capillary bronchitis with extensive bronchopneumonia due to the streptococcus pyogenes. In this case cover-slips taken from the deep portion of the necrosed area showed only the long, thread-like organisms and cultures, both aërobic and in Buchner's jars, were absolutely sterile. The following is the description of the microscopic lesions:

The lesion occupies the skin around the anus and the subjacent fat and connective tissue. The sections show that the entire skin and the subjacent tissue for some depth beneath it are completely necrotic. Every tissue in the necrotic area is totally devoid of nuclei, and no nuclear fragments are to be made out. In sections stained with hæmatoxylin and eosin bluish masses of bacteria can be seen. Between this necrotic area and the healthy tissue is a narrow zone showing inflammatory reaction. The fat and connective tissue in this zone are infiltrated with polynuclear leucocytes. These are only moderate in number. There is absolutely no sign of regenerative changes in the affected tissues. Sections stained by Gram's method show in the superficial portions of the necrotic zone a variety of bacteria; many are cocci in pairs and chains, and there are many long thread-like forms faintly stained. Sections stained with eosin and methylene blue show that many short bacilli are also present. The deeper parts of the necrotic area show a single organism which is also present in the zone of reaction, and to a slight extent in the healthy tissue. It is seen best in sections stained in carbolfuchsin and decolorized by oil of cloves, according to Flexner's method.

It presents exactly the same appearance as the organism which was constantly present in cover-slips from all the cases. In the deeper part of the necrotic zone the organism is present in enormous numbers. The individual bacteria are nearly always seen as very long threads, which for the most part lie parallel to and between the fibrillæ of the connective tissue. The organisms follow with remarkable fidelity the wavy arrangement of the connective tissue fibrils in many instances. This is not always the case, for a good many shorter forms are seen which run crosswise to the connective tissue fibrils. The number of organisms in the reactionary zone is much less than that in the necrotic zone, and there is a gradual diminution in number as the healthy tissue is approached, though a small number of the organisms are found in apparently unaltered tissue.

As a result of this investigation and of an analysis of the literature, it must be concluded that noma, while originating in all probability as a simple infection, is always in its later stages a mixed infection, and that, while it is probably not always due to the same organism, it is most frequently due to a long thread-like organism of the leptothrix type, which does not grow upon ordinary culture media. Krahn's assumption that it is due to mouth organisms is negatived by finding similar organisms in noma of the genitalia.

SOME NEW POINTS IN REGARD TO RAYNAUD'S DISEASE.

By Carl Beck, M.D.,
of New York.

That the tissue changes in Raynaud's disease are not confined to the soft tissues, but also affect the bones, can be well demonstrated by the Röntgen rays. The following cases may serve as an illustration:

Case I.—A woman, aged forty-two years, who had been well until fourteen years ago, noticed a slight pain in the index finger of her left hand. At the same time there was a marked pallor of the whole finger. Four months after the sudden onset of the pain repeated congestion was observed in the region of the second and third phalanx of the same finger, which continued until about six months after the onset of the first symptoms. The tip of the finger became dry and black. Amputation was then performed. The patient regained and kept her health until six months ago, when the same pain and pallor extended symmetrically over both hands.

When I saw the patient for the first time I noticed great pallor of the third, fourth, and fifth left fingers, and of the little right finger.